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ABSTRACT

This lesson, which is based on a field trip to Lowell, Massachusetts, focuses on Lowell's preeminence as a textile weaving center beginning late in the 18th century. The lesson offers advice for managing the tour group, provides historical background on Lowell, the textile industry, and the United States and the world in general at the time, and forecasts the economic outlook for Lowell in today's world markets. The lesson provides a timeline of events and an extensive selected bibliography. (BT)

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The Early Industrial Revolution

An Overview

SO 031 202

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Tsongas Industrial History Center

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University of Massachusetts
Lowell

College of Education

The Tsongas Industrial History Center is a joint educational enterprise sponsored by the University of Massachusetts Lowell and Lowell National Historical Park. Established in 1987, its goal is to encourage the teaching of industrial history in elementary and secondary schools.

TEACHER TIPS FOR A SUCCESSFUL VISIT TO LOWELL

Chaperones : Each class must be accompanied by one adult for every ten students. Consider recruiting grandparents and neighbors. Please distribute a copy of these tips to each of your chaperones and ask that they stay with the group and take an active role in assisting with the class.

Group Management : Each program has its own leader who is responsible for its content. Teachers and chaperones are responsible for all group management and discipline issues. You, after all, know your students best; we look to you to help see that the day runs smoothly. Your cooperation and active involvement will help us to do our job!

Name tags : Please have your students wear name tags so that the program leader can actively engage students by calling them by name.

Bathrooms : Itinerary includes a bathroom break. Only limited facilities are available on arrival.

Weather : All programs require some outside walking, rain or shine. Have students dress accordingly and remember to remove jackets from the bus on arrival.

Special Needs : Notify the Reservations office at (508) 970-5000 in advance if your group has any special needs or considerations.

Cancellations : If you must cancel your program, you must do so within two weeks of your scheduled visit to avoid forfeiture of your payment.

Bus Drop Off and Arrival in Lowell

•You will be going first to the Boott Cotton Mills Museum bus drop-off point. Please MAKE SURE TO GIVE THE ENCLOSED DIRECTIONS TO YOUR BUS DRIVER.

•Group students (and their lunches) by program title on the buses, e.g. Bale to Bolt, Workers on the Line.

•Your group will be met on arrival at the bus drop-off point by the Tsongas Center facilitator and your program leader who will explain details of the day's itinerary and activities.

•Please wait on the bus for instructions before unloading.

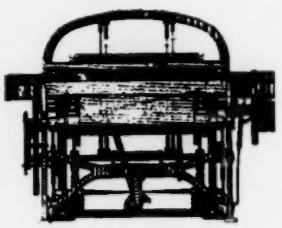
Lowell: The Experiment on the Merrimack

Step back in time two hundred years--before the age of factories. America is a nation of farmers, and the forces of nature have not yet been harnessed on a large scale. Rumors of English industrial textile production have spread to New England. The history of Lowell and America's industrial revolution begins with the story of a river.

The River

Water from New Hampshire's White Mountains rushes through countless streams, merging to form the headwaters of the Merrimack River. The river courses south into Massachusetts and is joined by hundreds of tributaries in its race to the Atlantic Ocean. Near the confluence of the Concord and Merrimack rivers, an enormous volume of water plummets over thirty feet at a site known as the Pawtucket Falls. The city of Lowell exists because of this waterfall.

Harnessing Water for Weaving



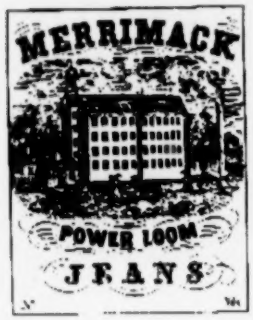
By 1821, the technology of using wheels to convert falling water into energy to drive machinery was well understood. However, two important developments--the power loom and the factory system--were new to the United States. The design for the power loom had been spirited out of England just ten years earlier by a wealthy Boston merchant, Francis Cabot Lowell.

In 1811, Lowell visited England where he saw for himself the new technology of mechanized textile production. The power loom, which wove cloth in great quantities, was a new English invention and its export was prohibited. Lowell memorized the mechanics and general construction of the loom, intent on returning to America to build a working model for use in American textile factories. In 1812, Lowell returned to the United States and engaged the services of mechanic Paul Moody. A year later, the two fabricated a working prototype of an American power loom.

Capital and Industry

Francis Cabot Lowell envisioned an entire community involved in textile production, a planned industrial city. To raise the capital needed for such a venture, he enlisted support from a group of investors later dubbed the "Boston Associates." Lowell and his investors built a textile mill on the Charles River in Waltham, Massachusetts. By 1817, the factory was an economic success, and the Boston Associates began looking to expand beyond the limited power-producing capacity of the Charles River. Lowell died that year, but the investors recognized the potential of his vision and forged ahead with his ideas and plans. They set out to find a power source around which to build a large-scale manufacturing center.

Mills on the Merrimack



Although the Pawtucket Falls are located many miles northwest of the important port city of Boston, they offered an ideal site for water-powered manufacturing. In 1821, the Boston Associates purchased land around the falls and the rights to the Pawtucket Canal, a small transportation canal built in the 1790s to circumvent the falls. The Associates built several mills and financed the enlargement of the Pawtucket Canal for water power. The first mills opened in 1823. During the next 25 years, additional mills and an intricate series of power canals were built. By 1848, Lowell was the largest industrial center in America. Fifty thousand miles of cotton cloth--enough to circle the world twice--was produced in the city each year.

Women at Work: Lowell's Early Labor Force

Machines require people to tend them, so it was necessary to recruit a massive work force. People in the United States had heard of the degraded condition of English workers, and the Boston Associates believed that such conditions would not be tolerated in America. They decided to run their mills using a work force of young women recruited from New England farms. Lowell became as much a social experiment as a technological one and was known around the world as the "Golden Experiment."

Life on the Corporation

Lowell's "mill girls" were expected to stay in the city only a few years. The idea was that they would return to the farms, leaving their positions vacant for other women. The result would be an industrial revolution without the creation of a permanent working class.

Initially, everything seemed to work according to plan. Women flocked to the "City of Spindles" where they could earn money and take advantage of a city's cultural offerings. Boardinghouses owned and managed by the corporations served as "home" for these young women. Although crowded, the quarters provided an atmosphere in which women could share experiences and forge bonds of solidarity. By the 1840s, nearly 10,000 Yankee women had left farms to work in Lowell's ten major textile corporations.

Mill life had negative aspects. The ringing of bells replaced the sun and the seasons as signals for daily tasks. Company rules regulated women's lives both at work and after hours: Curfew was at 10 pm, church attendance was mandatory, and any sign of improper behavior was grounds for dismissal.

The End of the Golden Experiment

The experiment on the Merrimack carried within it the seeds of its own destruction. Success spawned competition: Investors saw the potential for huge profits, and new industrial cities sprang up along the nation's waterways. Textile prices fell. To keep dividends high, mill owners cut labor costs. Workers were required to tend more machines, and the speed of the machines was increased.

Working conditions became a source of growing discontent. The noise of textile machinery deafened workers. Whirring gears and rapidly spinning belts were rarely covered by protective devices, and the accident rate was high. Worst of all, weave rooms were unventilated. Many workers were stricken with brown lung disease, a life-threatening illness caused by inhaling cotton dust.

Exhausted by rigorous work schedules and disenchanted with the indifference of corporations toward their well being, many operatives organized to improve working conditions. In 1844, hundreds of women united to form the Lowell Female Labor Reform Association. Thousands of workers signed petitions urging the state legislature to pass a law limiting the length of the work day to ten hours. Legislators ignored these protests; not until 1874 did Massachusetts move to restrict the length of the work day. Even then, employers found many ways to evade the law.

The Ten Hour Movement and other early protest efforts were largely unsuccessful, in part because women had no political voice. Many women left the mills. Vacant positions were eventually filled by immigrant adults and children, and the "Golden Experiment" ended.

The Immigrant Experience

Irish immigrants began coming to Lowell during the 1820s. Irish men were a vital force behind canal and mill construction. Management considered the Irish good enough to work outdoors, but, with the exception of some women, most were excluded from working inside the mills. By the late 1840s, mill owners were compelled to change this policy because of labor shortages. Irish immigrants, driven from their homeland by the potato famine, assured mill owners of a plentiful and needy labor pool.

By 1860, nearly 25% of the city's 37,000 residents were Irish or born of Irish parentage. Soon after, Lowell became home to thousands of French Canadians, some of whom had been recruited by mill agents. Following the French Canadians came immigrants from dozens of different countries, mostly from Eastern and Southern Europe.

A City in Transition

Over the years the character of Lowell changed. Since immigrants were driven from their homelands for economic, political, or religious reasons and were desperate for jobs, it was no longer necessary for management to maintain a paternalistic interest in the welfare of the workers. In time, the boardinghouse system broke down, and workers crowded into tenements. Real wages were even lower than they had been in the "mill girl" era, forcing whole families to work in the mills. Water power was augmented by coal-burning steam engines, and the once clean, bright appearance of Lowell was lost under layers of soot and grime.

Lowell changed from a city peopled primarily by young, single workers to a city of families and ethnic communities. Community life revolved around churches, coffee houses, and fraternal organizations. Newcomers created ethnic neighborhoods that in many ways resembled the worlds they had left behind. This environment eased the transition into a new culture, allowing immigrants to maintain traditions, share customs, and create new traditions.

At Work in the Mills: Labor vs. Management

Mill work was as grueling for immigrants as it had been for "mill girls." Advances in technology in mid-19th century Lowell were designed to increase productivity but did little to improve working conditions. Factory workers labored long hours in hot, humid, and crowded conditions. Periodic "speed-ups" and "stretch-outs" contributed to the high rate of accidents and work-related illness. Safety regulations were virtually nonexistent. A high premium was placed on production.

Though well aware of dangerous working conditions, unfair hiring practices, and inadequate wages, immigrant workers had few avenues for voicing their grievances. A troublemaker was quickly fired and replaced by one of the thousands of new immigrants in search of work. Mill owners prevented attempts to organize by keeping workers from different ethnic groups in separate workrooms and deliberately provoking conflict among groups. It wasn't until the strike of 1912 that laborers collectively stood up for their rights, forcing management to address their grievances. That year, an outside group, the Industrial Workers of the World, organized Lowell's workers across class, gender, and ethnic lines.

Over time, the once clearly marked boundaries of ethnic neighborhoods grew fuzzy. Interaction between members of different groups became commonplace. Shared customs gave people a sense of place in the community, while new traditions fostered a sense of ownership in the city.

Technological Change and the End of an Era

Less than a century after the city began its rise to industrial eminence, Lowell entered a period of decline sparked, in part, by changes in technology. The rise of steam power in the late 19th century undermined the very foundation on which Lowell had been built--the water power of the Pawtucket Falls. By the middle of the 20th century, most of the city's textile mills had shut down, many moving south where raw material and cheaper labor were readily available. Lowell's days as a bustling textile center drew to a close.

Lowell Today

The transformative power of technology is clearly visible. Technological innovation and obsolescence are recurrent themes in Lowell. After an economic resurgence built around higher education and high technology in the early 1980s, the city's economic climate has again cooled. Many feel confident that a new mix of technology, improved education, and cultural vitality has positioned the city for success in the 1990s.

Immigrants from India, Central and South America, and Southeast Asia are coming to Lowell for reasons similar to those of their earlier counterparts. Many of the mills house new industry and business. For Lowell, technological and social changes continue to play an integral role in shaping the city's growth and character.

Timeline of Events

1769	*Richard Arkwright patents spinning frame (England), and opens first successful water-powered spinning mill in 1771.*
1776	*Declaration of Independence.*
1787	*Edmund Cartwright patents power loom (England).* *Constitutional Convention held in Philadelphia.*
1789	*Beginning of French Revolution.*
1790-91	*Slater Mill opens in Pawtucket, RI; first successful US spinning mill.*
1793	*Invention of cotton gin. US cotton production increases nearly 7,000% by 1815; as a consequence, the economic value of slavery soars.*
1796	*Completion of Pawtucket Canal opens Merrimack River to commercial traffic.*
1807	*Embargo Act closes off all US trade with Europe due to Napoleonic Wars.*
1810-12	*Francis Cabot Lowell visits England; memorizes workings of power loom.*
1813	*FC Lowell founds Boston Manufacturing Company in Waltham; first integrated textile mill in the world (all steps of production in one building).*
1817	*Death of Francis Cabot Lowell.*
1821	*Merrimack Manufacturing Company founded in East Chelmsford by Patrick Tracy Jackson, Nathan Appleton, Kirk Boott and other "Boston Associates."*
1822	*Irish immigrants and others begin digging canals for water power.*
1823	*Mill agents begin recruiting young women from New England farms to work in the mills; they live in boardinghouses run by the corporations.*
1826	*East Chelmsford renamed Lowell.*
1834	*First "turnout" (strike) in Lowell protests a wage cut; it ends in failure.*
1835	*Boston and Lowell Railroad begins service, one of the first rail lines in the US.*
1837	*Financial panic leads to nationwide Depression that lasts for several years; fledgling labor movement is undermined because of high unemployment*
1843	*First telegraph line built from Washington to Baltimore by Samuel Morse.*
1844	*The Ten Hour Movement begins; workers petition the state legislature to pass a law limiting the workday to ten hours (not successful).* *Founding of the Lowell Female Labor Reform Association.*
1844-45	*Uriah Boyden and James B. Francis develop inward-flow turbine. Turbines begin to replace water wheels in Lowell mills.*
1845-51	*Potato famine in Ireland leads to massive emigration; many settle in Lowell and begin to supplement Yankee women in the work force.*
1846-47	*Mexican War is opposed by most New Englanders, who see it as a war to extend slavery. Mill owners, however, are anxious to appease plantation owners and keep cotton prices low.*
1847	*Opening of Northern Canal marks completion of Lowell's 5.6 mile power canal system, the largest such system in the world.*
1850	*Annual production of 50,000 miles of cloth makes Lowell the largest industrial center in the US; population of 33,000 is second largest in Massachusetts.* *Fugitive Slave Law infuriates many in North.*
1860	*75% of the world's cotton is grown in the southern US.* *Cotton accounts for 60% of all US exports.*

1861-65	*Civil War. Most textile mills in Lowell and elsewhere sharply reduce production due to lack of cotton. Thousands of textile workers lose their jobs.*
ca 1865	*Beginning of massive influx of French Canadians into Lowell and other New England mill towns. They settle in Little Canada neighborhood, and comprise 20% of the city's population by the early 20th century.*
1870s	*Steam power begins to replace water power. By 1880, Fall River has surpassed Lowell as the largest textile manufacturing center in the US.*
1874	*Massachusetts legislature finally passes a law limiting the work day to ten hours. Many employers fail to comply with it.*
1875	*Strike by male mule spinners is unsuccessful when they refuse to make alliance with immigrant and women workers.*
1890s-1900s	*Immigrants from Greece, Poland, Portugal and other southern and eastern European nations begin arriving in Lowell (and elsewhere) in large numbers.*
1893	*Beginning of nationwide Depression.*
1903	*Anticipating a strike, all Lowell textile mills lock out workers. United action by mill management prevents improvements in wages and working conditions.*
1912	*Textile workers in Lawrence respond to a wage cut with a general strike. Led by the Industrial Workers of the World, the "Bread and Roses" strike soon spreads to Lowell. Workers win major wage gains, but do not form a lasting union.*
1914-18	*World War I temporarily revives the depressed New England textile industry.*
1918-32	*Eight of Lowell's original eleven textile companies move or go out of business.*
1921-24	*Congress passes laws restricting immigration to about 15% of pre-1914 levels.*
1929	*Stock market crash is followed by prolonged nationwide Depression.*
1935	*Wagner Act legalizes labor unions in US.*
1938	*First successful union representation election in Lowell occurs at Merrimack Manufacturing Company.*
1939-45	*World War II temporarily revives depressed New England textile industry.*
1950s	*Last three of Lowell's original eleven textile companies move or go out of business.*
1960s	*Destruction of historic boardinghouses fuels historic preservation movement.*
1970s	*Lowell begins a period of economic revival as many high-tech companies open plants.*
1978	*Congress creates Lowell National Historical Park to interpret the industrial revolution.*
1987	*Tsongas Industrial History Center created by cooperative agreement between University of Massachusetts Lowell and Lowell National Historical Park.*

Selected Bibliography/Reading List for Tsongas Center Programs

General Selections (all programs)

•*Dublin, Thomas. The Story of an Industrial City. Washington D.C.: National Park Service, 1993. This is the Lowell National Historical Park Handbook. It is the best single source on Lowell history. Many excellent color illustrations.*

• *Eno, Arthur L. Cotton Was King: A History of Lowell. Lowell, MA: Lowell Historical Society, 1976. Especially pp. 69-161, and 190-218. This was formerly the principal introduction to Lowell history. It has some faults, but it remains a valuable resource.*

• *Dunwell, Steve. Run of the Mill. Boston: David R. Godine, Publisher, 1978. Pp. 28-49 are an excellent introduction to Lowell. Covers numerous aspects of social as well as industrial history.*

• *Dalzell, Robert. Enterprising Elite: The Boston Associates and the World They Made. Cambridge, MA: Harvard University Press, 1987. Especially pp. 5-73. Another excellent introduction to the origins and early years of Lowell. It gives good perspective on how Lowell fits into the larger picture of American history.*

Selections for Specific Programs*

*Key

BtoB is Bale to Bolt
Y&I is Yankees and Immigrants
IF is Invention Factories
WoL is Workers on the Line
PtoP is Power to Production
All selections recommended for IF and PtoP are also recommended for Power and Invention.

• *Albert, Felix. Immigrant Odyssey. Orono, ME: University of Maine Press, 1991. Y&I. Autobiography of an illiterate French-Canadian immigrant who came to Lowell in 1881, dictated to an unknown transcriber. Fascinating look at life in both Quebec and Lowell from someone who was there.*

• *Bender, Thomas. Toward an Urban Vision: Ideas and Institutions in Nineteenth Century America. Baltimore: Johns Hopkins University Press. PtoP, Bto B, IF, WoL. Especially pp. 19-129. Excellent discussion of the changes which the Industrial Revolution caused in the ways people think and look at the world.*

• *Blewett, Mary H. ed. The Last Generation. MA: University of Massachusetts Press, 1990. Y&I, BtoB. A series of interviews/oral histories with mill workers who worked in Lowell in the first half of the 20th century. Excellent discussion of working conditions, gender issues, ethnicity and more.*

• *Blewett, Mary H. ed. Surviving Hard Times: Working People of Lowell. Lowell, MA: Lowell Museum, 1982. Y&I, BtoB, WoL. Especially pp. 11-21, 43-105. Oral histories and accounts of several important strikes.*

• *Bodnar, John. The Transplanted. Bloomington, IN: Indiana University Press, 1985. Y&I. This is the best general work in print today on the history of immigration.*

• *Caney, Steven. Steven Caney's Invention Book. NY: Workman Publishing, 1985. IF Good "how to" book. Invention process, patent application, etc.*

• *Chetin, Helen. Angel Island Prisoner 1922. Berkeley, CA: New Seed Press, 1982. Y&I Fictional account of a young Chinese immigrant girl's experiences.*

•*Dublin, Thomas. Farm to Factory: Women's Letters 1830-1860. NY: Columbia University Press, 1981. Y&I, BtoB, PtoP, WoL. A series of letters written by and to several Lowell "mill girls." Great primary source for life in early Lowell.*

• *Dublin, Thomas. Women at Work: The Transformation of Work and Community. New York: Columbia University Press, 1979. Y&I, BtoB, PtoP, WoL. Especially pp. 1-132; also 132-165 for Y&I. The classic study of Lowell's early work force. Excellent coverage of all aspects of daily life, accounts of early strikes and political protests.*

• *Fisher, Leonard Everett. The Factories. NY: Holiday House, 1979. PtoP, IF. Good, straightforward discussion of technology, some discussion of Golden Experiment.*

• *Hunter, Louis C. Waterpower. Charlottesville: University of Virginia Press, 1979. PtoP, IF. Especially pp. 204-227, 328-338. Very good discussion of hydraulics in general, and also as applied to Lowell.*

•*Karabatsos, Lewis, and McLeod, Robert. Fixed in Time: Photographs of Lowell, MA 1860-1940. Lowell, MA: Lowell Historical Society, 1983. Y&I. Great collection of photos.*

• *Lord, Athena. A Spirit to Ride the Whirlwind. NY: MacMillan Publishing Co., 1981. Y&I, BtoB, WoL. A great children's novel, loosely based on the childhood experiences of Harriet Hanson Robinson. Very accurate portrayals of mill and boardinghouse life. Out of print.*

• *Macauley, David. Mill. Boston: Houghton Mifflin, 1983. PtoP, IF. Especially sections dealing with water wheels and power transmission. Excellent discussion of how water power works; extensively illustrated.*

• *Macauley, David. The Way Things Work. Boston: Houghton Mifflin, 1988. BtoB, IF. Excellent pictures and discussion of technology for the lay person.*

• *Malone, Patrick. Canals and Industry: Engineering in Lowell, 1821-1880. Lowell, MA: Lowell Museum, 1983. PtoP, BtoB. Classic description of Lowell's canal system.*

• *Mayerson, Evelyn Wilder. The Cat Who Escaped from Steerage. NY: Charles Scribner's Sons,1990. Y&I. Fictional account of hardships of crossing the Atlantic in steerage. Easy to read.*

• *Meltzer, Milton. Bread and Roses: The Struggle of American Labor 1865-1915. NY: Mentor Books, 1977. BtoB, WoL. Very good background on US labor history. Puts what happened in Lowell into the big picture.*

• *Homespun to Factory Made: Woolen Textiles in America, 1776-1876. North Andover, MA: Merrimack Valley Textile Museum, 1977. BtoB. Excellent coverage of both pre-industrial and industrial textile production. NB: There are some differences between cotton and wool processing.*

• *Mitchell, Brian. The Paddy Camps. Chicago: University of Illinois Press, 1988. Y&I, BtoB. Extensive case study of the Irish experience in Lowell.*

• *Paterson, Katherine. Lyddie. NY: Lodestar, 1990. Y&I, BtoB, WoL, PtoP. Very nice historical novel for middle-school children; entertaining and accurate.*

• *Purcell, Carroll, ed. Technology in America. Cambridge, MA: MIT Press, 1981. PtoP, IF. Especially pp. 92-104. Excellent discussion of James B. Francis and his Lowell hydraulic experiments.*

• *Robinson, Harriet Hanson. Loom & Spindle or Life Among the Early Mill Girls. Kailua, HA:Press Pacifica, 1976. Y&I, BtoB, WoL. Memoir of an extraordinary woman who spent her childhood in Lowell. First published in 1898, it recalls events of the 1830s.*

• *Smithsonian Institution. The Smithsonian Book of Invention. Washington, DC: Smithsonian Institution, 1978. IF. General history, overview of inventing. Nicely illustrated.*

• *Stanish, Bob. The Unconventional Invention Book. Carthage, IL: Good Apple, Inc., 1981. IF. Good ideas for working with kids on inventions and science projects.*

• *Tifft, Wilton S. Ellis Island. Chicago: Contemporary Books, 1990. Y&I. Beautifully illustrated treatment of the immigrant experience.*

• *Weible, Robert, ed. The Continuing Revolution. Lowell, MA: Lowell Historical Society, 1991. Y&I, BtoB. A volume of essays on Lowell history into the 20th century.*

TSONGAS INDUSTRIAL HISTORY CENTER

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